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CHANGE IN MOISTURE CONTENT OF LUMBER DURING RAIL SHIPMENT[1]

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Engineers are interested in the degree of seasoning at which standard sizes of lumber apply, and frequently also in the possibility of obtaining lumber of some specific moisture content that fits it for a special use without the risk of changes in dimension due to shrinkage and swelling. It is, therefore, important to know to what extent the moisture content of lumber changes during the long rail hauls that are now a common necessity of lumber marketing.

This paper presents the results of an investigation made to determine whether or not lumber placed aboard cars at the sawmill at a low moisture content will change in moisture content during transit to such a degree as to defeat the purpose of careful seasoning for general or specific uses.

As a preliminary step in the study, representatives of the Forest Products Laboratory and of the Forest Service district products office, Missoula, Mont., early in 1926 determined the change in moisture content of six carloads of lumber shipped from Idaho to the vicinity of Chicago. The late winter and spring season was selected as the time for the tests because this is the period of highest humidity of the year. In the six cars tested containing largely inch-thick flat stock of white fir, ponderosa pine, and western white pine, the moisture change of material while in transit was slight except for some material with 30 percent average moisture content that lost about 5 percent.

In view of the small changes which these shipments showed, the Forest Products Laboratory decided in 1927 to determine not only the change in average moisture content for carloads of lumber, but to show in what portion of the load local changes, if any, were taking place. The cooperating company, whose plant is located in western Oregon, was shipping clear grades of Douglas-fir kiln dried to an average of 8 percent moisture content and common grades of Douglas-fir kiln dried to approximately 20 percent. Five cars of flat clears were tested, one car of clear quarter-round and crown molding, and one car of common shiplap. Eighteen sample boards were placed in the same relative position in each car. They were protected from any extra moist boards in the vicinity by being placed between check boards of approximately the same moisture content as the sample. Each sample board was sampled for moisture content and weighed to the nearest hundredth of a pound at the time it was placed in the car. At destination (Chicago) the sample boards were again weighed and moisture content tests were made. As a check upon these two methods of determining the change in moisture content the total weight of each shipment was

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determined at the point of origin and destination by weighing the car loaded and empty. The results obtained by all three methods, namely, (1) change in weight of sample boards, (2) change in weight of total shipment, and (3) change determined by moisture content determinations of the samples at origin and destination, were so similar that only those changes shown by the sample board weights need be considered here.

The data obtained are shown in the accompanying table and illustrated graphically in the diagrammatic cross-section of the freight car. For the five cars of flat clear Douglas-fir the average change in moisture content was a 0.2 percent increase (based on the oven-dry weight of the samples); for the more loosely loaded molding, 0.8 percent increase; and for the common lumber a loss of 0.4 percent. The changes were so small as to fall well within the possible error of moisture determinations. The samples distributed throughout the loads gave no definite indications of local changes. As all of these shipments were made from the West Coast two-thirds of the way across the continent, with only the ordinary precautions used in loading box cars during the wettest period of the year, it is quite reasonable to conclude that during the usual haul in good box cars no appreciable change in moisture content of lumber need be expected.

This information is significant. It means that stock placed in the car in satisfactory condition as to moisture content will reach the unloading point in practically the same condition. If, on the other hand, it is received in bad condition by the consignee, the fault, unless the car is in a poor state of repair, must be with the seasoning methods employed.

The virtual elimination of this "unknown" between shipper and consignee brings the moisture content problem one step nearer solution.

Change in moisture content of Douglas-fir lumber shipped by rail during the winter season from the West Coast to the vicinity of Chicago.

Carload shipment number	Date shipped	Date reached consignee	Grade	Average moisture content when loaded	Change in moisture content in transit
	1927			Percent	
1	Jan. 25	Feb. 10	Clears	8	+ 0.2
2	Feb. 4	Feb. 28	"	8	+ 0.3
3	Feb. 10	Mar. 4	"	10	+ 0.3
4	Mar. 18	Apr. 5	"	9	- 0.1
5	Mar. 25	Apr. 16	"	7	+ 0.3
Av.				8	+ 0.2
6	May 5	May 25	Quarter-round and crown moulding	8	+ 0.8
7	May 6	May 24	Common	21.0	- 0.4

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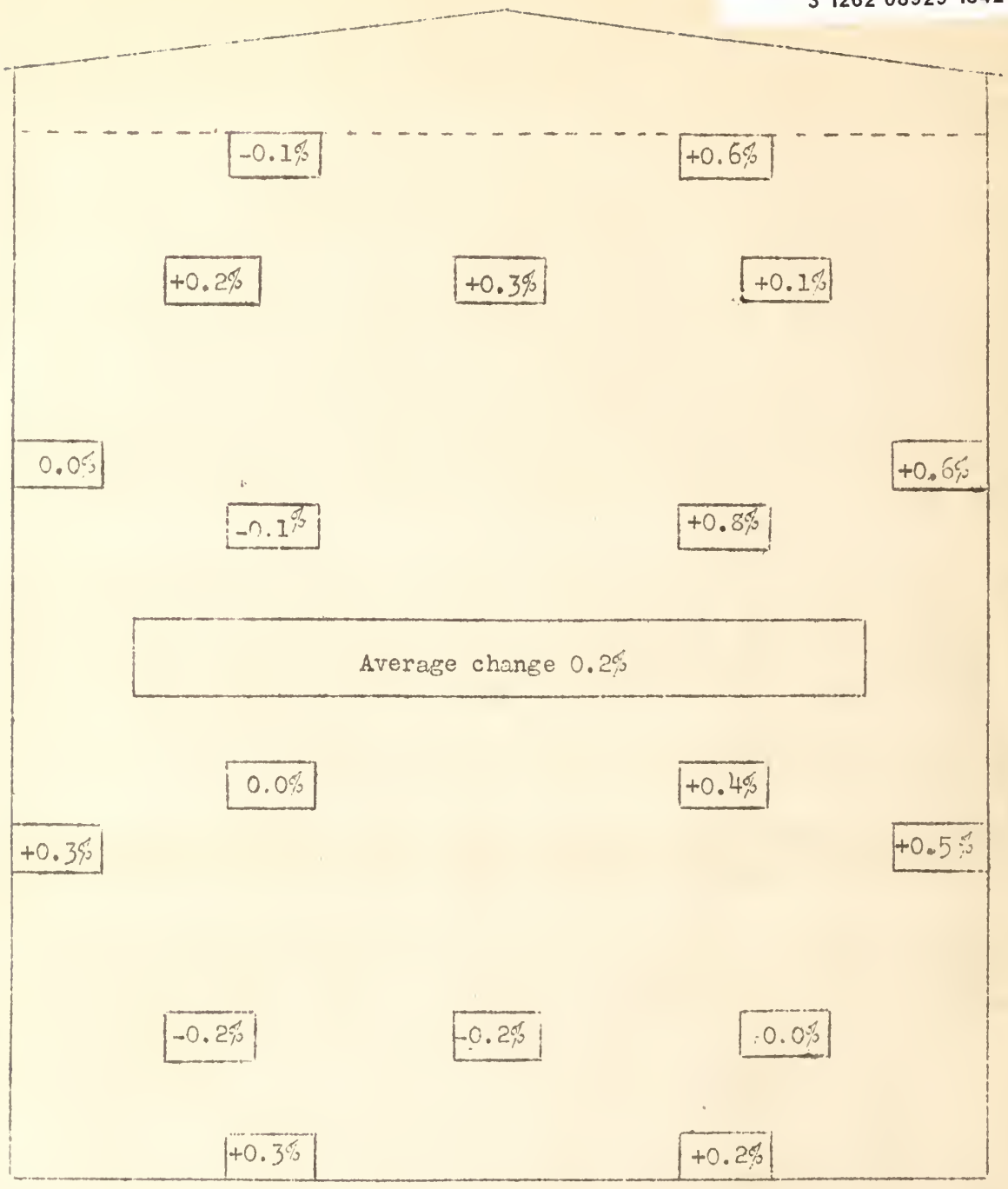

Diagrammatic cross section of freight car as loaded with clear grades of Douglas-fir. The small rectangles indicate the location of the sample boards within load in the 1927 tests. Figures in small rectangles show average local change in moisture content of lumber during transit.